VBrick EtherneTV™ and Cisco IP/TV®

Introduction

VBricks™ are self-contained video network appliances that can simultaneously stream MPEG video to VBrick decoders, to PC's outfitted with StreamPlayerII™ software, and to unmodified third party players such as Cisco IP/TV. Existing desktops running the IP/TV client, for example, can now view real-time video from anywhere, anytime, and people located in conference rooms, classrooms, common areas, and other locations can view the live video on standard TV monitors without needing a PC.

An existing network that is using Cisco IP/TV will instantly, automatically, and painlessly detect and play live video streams from any number of VBricks, and those VBricks may be located anywhere in that network.

Live Video

Server-based video "streaming" systems are typically not optimized for live video, and conventional thinking would have you install a "video capture card" into the streaming server to stream live content. Assuming the software drivers for your video card do not upset the server, the source of the live video is rarely physically near the location of the server (few people are interested in broadcasting a video of their wiring closet!). Further, the number of "slots" in a server limits the number of live video feeds, and each video card consumes PCI bus and host processor capacity.

Rather than installing special cables and running analog video from a remote location to a central server, it is better to place video encoders nearest the source of the video and have the encoder stream directly to your clients. Live encoder locations might include:

- CEO Office for Corporate Address
- A central VCR or DVD library - so tapes can be played without needing to go through an encoding process
- Parking Lots and entrances for security & monitoring
- Manufacturing areas for Process monitoring
- Near cable feeds to deliver live television for information and entertainment

Prevent VOD Denial Of Service

A central video server is, by definition, the repository of video content. From a networking point of view, it is "bad enough" that all of the high bandwidth video continuously flows from this one source. A video server that is asked to deliver ten 1 Mbps video streams will use all the capacity of one 10BaseT Ethernet port, and fifty streams at 2 Mbps will use the entire capacity of a 100BaseT port, etc. Further, the network must deliver the traffic to distributed users from this one concentration point, increasing the potential for upstream choke points in the network core. Streaming live video from such a server by inserting "Video Capture Cards" (Figure 1) reduces the server's ability to deliver stored video.

Video servers typically play the odds, betting that users view the content for some limited period (the length of the file) and then stop, freeing up the bandwidth for another user or for the next piece of content. Live video can dramatically reduce a server's capacity because it consumes the server's available network bandwidth on a full time basis. Further,

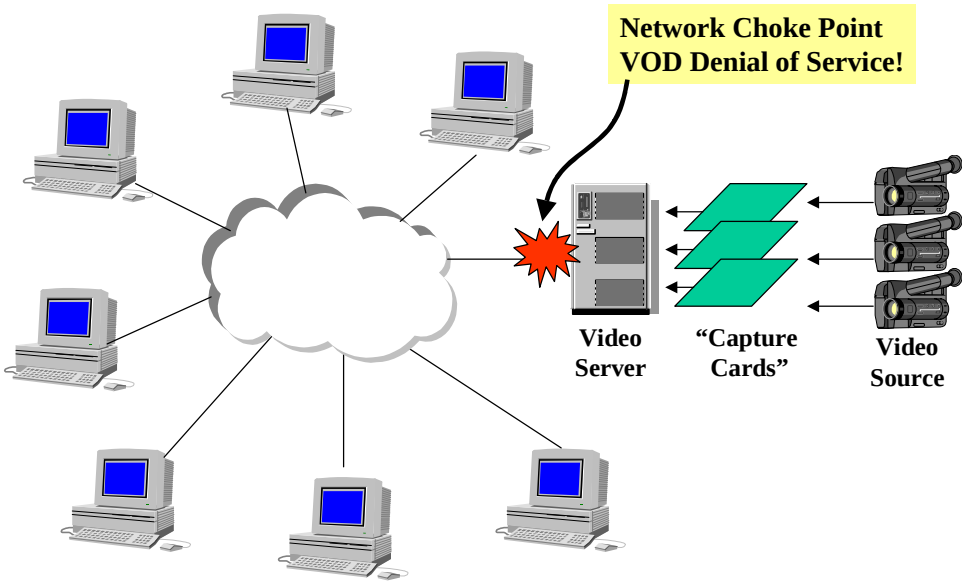

Figure 1

video servers are selected for their ability to store large volumes of data (video) and their ability to rapidly deliver this data from disk. Anything that limits the server's ability to reach its maximum disk-to-network delivery performance causes the server to become a "stranded investment". In other words, delivering live video from a server can cause $20,000 server to behave like a $10,000 server.

A fully distributed live video system on the other hand (Figure 2), has no affect on a centralized video server whatsoever. It is appropriate to think of each VBrick as an additional video server -- independent of a centralized

server but related -- so that *as you add live video to your network you add to your overall video capacity instead of reducing your fixed capacity.* Further, it is better to encode

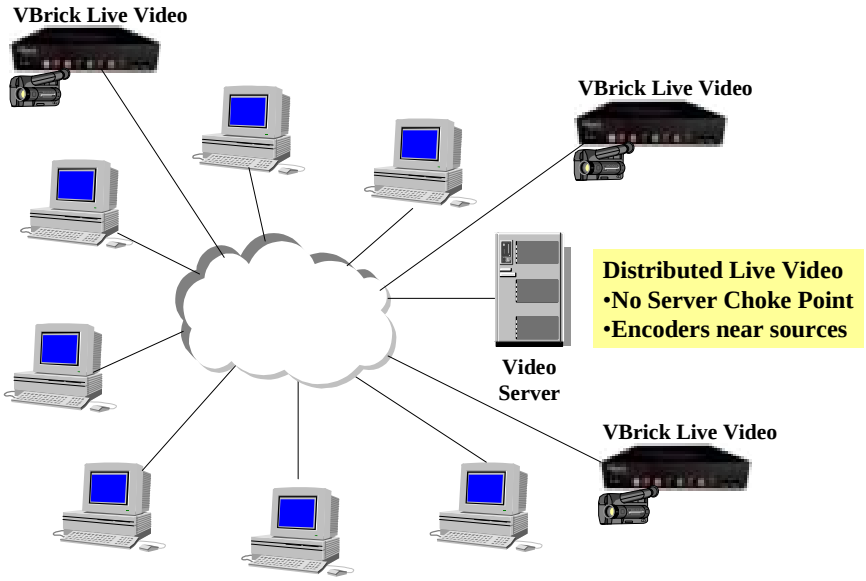

Figure 2

the live video as near as possible to the source, and the inside of a data center or wiring closet -- where servers are located -- is rarely a source of compelling live video. It is also not ideal to string analog video and audio cable to the back of a server in the data center.

Program Guide

VBrick and IP/TV use the same standards to advertise available content. VBrick's program guide is automatically transmitted by each VBrick, and can be detected directly by the IP/TV client (without the knowledge of a IP/TV server), or by the IP/TV server (in which case the client obtains program information from the server).

In either case there is full compatibility, and VBrick's Program Guide is sent directly from the appliance itself. This

is important because it means that your VBrick can be physically transported anywhere at any time and it will correctly identify itself to the viewer regardless of where it is installed. For example, a live broadcast can be conducted from any classroom, from the factory floor, from a conference room, etc., by simply plugging the VBrick into the network and the video can instantly be viewed via StreamPlayerII, IP/TV, and via other VBricks.

System Streams

The MPEG standards define a self-synchronizing "System Stream" for multiplexing MPEG elementary video and audio. This is the same standard that is used for professional video. Virtually all video players, including Microsoft Windows Media Player, can play MPEG system stream files, and third-party editors and tools are widely available[1]. MPEG system streams can be easily converted into the proprietary Microsoft ASF or Real format for web streaming using 3rd party tools. VBrick appliances deliver MPEG system streams over the network, and StreamPlayerII provides instant recording of these files in standard format. One advantage of the MPEG system stream is that both the video and audio is sent as a single stream to one network address.

RTP Stream

The Real Time Protocol, as its name implies, is a standard for streaming real time audio and video. RTP does not concern itself with the compression used, rather it defines a set of protocols to deliver audio and video in real time and deals with synchronization in a way similar to, but different from, an MPEG system stream. One advantage of RTP is that a player, such as IP/TV, can decode just the audio

[1] VBrick's StreamPlayerII and StreamPumpII includes MPEG editing capability.

portion of a stream in cases where there is insufficient bandwidth to view the video. Disadvantages include the necessity of sending the streams on multiple addresses (audio/video/control) and more importantly, the fact that saving a RTP file results in just that: an RTP file that requires secondary processing if it is to become a standard video file.

Dual Streaming

VBricks simultaneously streams both standard MPEG system streams and RTP. As a result, the same video source may be viewed on standard TV monitors, on StreamPlayerII desktops, and on Cisco IP/TV desktops (Figure 3). Importantly, VBrick's StreamPlayerII and Cisco's

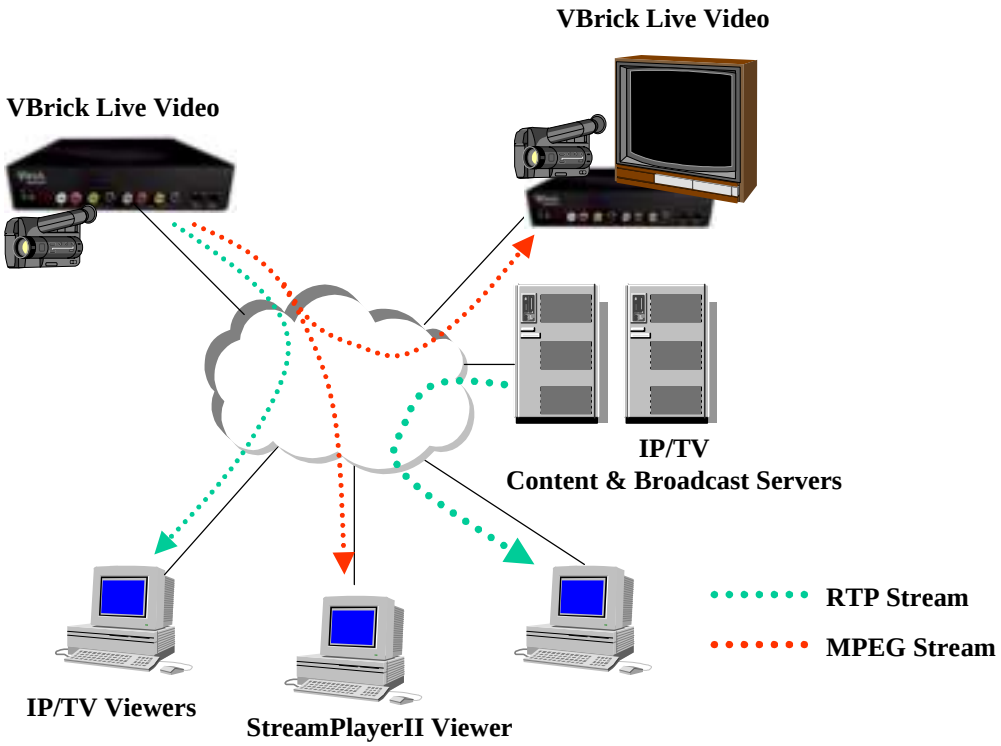

Figure 3

IP/TV viewer can co-exist on the same desktop at the same time, giving users a choice. For example, off-campus viewers with bandwidth concerns might use RTP and chose

audio-only, while campus viewers might use StreamPlayerII and view full screen television with CD-quality stereo audio. A single VBrick 3200 actually supports four simultaneous streams:

- Transmission of MPEG audio/video via MPEG System Stream
- Transmission of MPEG video via RTP/RTCP Stream
- Transmission of MPEG audio via RTP/RTCP Stream
- Reception of MPEG via MPEG System Stream

This unique capability provides a highly flexible system. For example, a pair of VBricks can provide two-way video conferencing while both ends of that conference may be viewed on desktops using either VBrick StreamPlayerII, 3rd party viewers such as Cisco IP/TV, or both.

Beyond One-Way

The value of fully distributed live video streaming may be obvious. The ability to deliver two-way video with the same equipment at the same time in the same network is equally valuable.

VBricks automatically set up two-way low delay interactive MPEG video for conferences. If the parties holding the conference desire, a virtually unlimited number of desktop viewers (using IP/TV client, StreamPlayerII, or both) may tune in and watch/listen to both ends of that conference from their desktops. This is ideal, for example, for distance learning, training, and moderated discussion applications.

Conclusion

VBrick's Dual Stream capabilities enable fully distributed live video networking, freeing up expensive centralized video servers to deliver more on-demand stored content. Cisco IP/TV and VBrick appliances work well together to deliver both on-demand and stored content to desktops, and VBrick appliances provide live video display of MPEG system streams and enable two-way interactive television.